



**SHELL POLYMERS**  
MAKING THE EXPERIENCE MATTER

**INDUSTRY 4.0**

# How to Enter a New Era of Manufacturing

**2020** WHITE PAPER



**Connected Equipment**



**Cloud-Based Technologies**



**Autonomous Technologies**



**Robotics**



**Sensors**

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# INTRODUCTION

Many manufacturing decision makers are eager to adopt emerging Industry 4.0 technologies like robotics and artificial intelligence. Despite that enthusiasm, it's a challenge to gather reliable, independent advice and expertise. Although there's a widespread belief that these advancements could unlock major competitive advantages, being able to harness and implement all the opportunities they offer is a major strategic challenge for C-suite executives.

These are exciting times for converters. Whether you are a film or pipe producer, or run an injection- or blow-molding operation, the polyethylene industry is highly robust, both globally and in the USA. Market research company Fortune Business Insights says the global polyethylene market is growing by 4.1% a year and predicts significant market growth in the USA, partly because of high demand from the healthcare, pharmaceuticals, electrical, electronics, packaging and automotive sectors.<sup>1</sup>

At the same time, many companies are beginning to implement Industry 4.0 technologies that offer exciting possibilities for enhanced competitiveness. That's why this white paper will help you:

- Learn what Industry 4.0 technologies other manufacturing companies are implementing
- Understand the preparedness of your industry peers
- Identify obstacles that could hinder progress – and how you can overcome them



## What is Industry 4.0?

Shell defines Industry 4.0 (or the fourth industrial revolution) as the digitalization and automation of manufacturing operations. It involves a wide range of technologies including:

-  Sensors
-  Robotics
-  Connected, autonomous, cloud-based and big-data-based technology
-  Augmented and virtual reality

There is a widespread belief that these advancements can help to:

- increase productivity
- cut maintenance costs
- extend equipment life
- reduce labor costs
- enhance efficiency
- and improve safety.

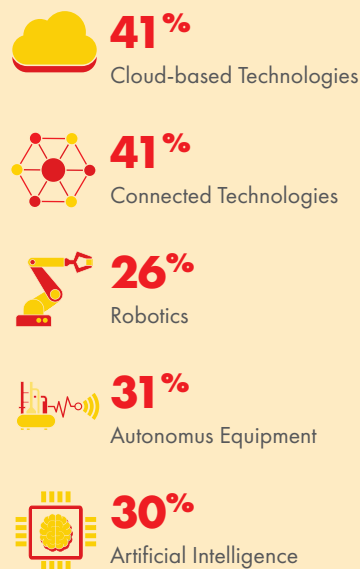
# INSIGHTS FROM THE GLOBAL SURVEY

To understand more about how converters and plastics executives perceive the trend toward Industry 4.0, Shell commissioned a major survey of manufacturing companies in China, Germany, India, Indonesia, Russia, the UK and the USA. Conducted by independent research firm Edelman Intelligence, the survey involved 350 interviews with sector executives.

The data indicates converters and other manufacturing companies are engaged and optimistic about Industry 4.0 technologies. That said, concern about the pace of change, technology costs, and the lack of expertise are hindering the widespread adoption.

**FIGURE 1**

Percentage of respondents that are using each Industry 4.0 technology.



## Key Finding #1

Industry 4.0 is already in action. Companies are engaged and taking initial steps toward this new era of manufacturing.

According to Shell's global survey, 80% of manufacturing companies are already using at least one Industry 4.0 technology. As shown in Figure 1, cloud-based and connected technologies are currently the most prevalent.

**FIGURE 2**

Obstacles to progress.

### 56% | Pace of Change

Feel that technology changes too quickly to justify the investment

### 61% | Knowledge Gap

A lack of understanding to a significant challenge to introducing new technologies

### 65% | Cost Concerns

Concerned that the costs of new technology may outweigh the benefits

### 66% | Lack of Senior Support

Believe the senior managers lack understanding about the benefits of new technologies

## Key Finding #2

The industry is optimistic, but cautious. Barriers to more widespread adoption still exist, including a concern that the costs outweigh the benefits.

Although the implementation of Industry 4.0 technologies is on an upward trend, various barriers are preventing more widespread adoption, according to the respondents. As shown in Figure 2, these include:

- **The pace of change.** Over 56% of the respondents said that they felt the technology is changing too quickly to justify the investment. In addition, 75% said they were unwilling to invest in new equipment while their current equipment is still operational.
- **Knowledge gaps.** A lack of understanding of how the new technologies work was a significant barrier for 61%. Many talked about the difficulties of upskilling workers and 70% said they would need to hire more experienced staff.
- **Costs.** The costs of investing in new, high-tech equipment outweighing the benefits was a concern for 65%; 69% felt it would be too expensive to maintain.
- **Lack of senior support.** Of those surveyed, 66% believe that their company's senior management lacks understanding about the benefits of new technologies.

## Key Finding #3

Converters and other manufacturers have revealed that they feel a lack of support from independent experts.

The challenges outlined above, particularly the knowledge gap, mean that companies are not currently set up for success in implementing Industry 4.0 technologies and seizing the opportunities that may lie ahead.

Many companies believe they would benefit from external support but feel this is currently unavailable. In fact, the survey revealed that some 56% of companies feel there is a shortage of trusted third-party experts who can provide support when introducing Industry 4.0 technologies. Consequently, many may feel powerless to drive their company forward.

**This is something that Shell wants to change, as it believes it is well placed to support customers' moves toward a connected, predictive and data-based future.**

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# REAL-WORLD INDUSTRY 4.0 APPLICATIONS ACROSS SHELL

Shell has been at the forefront of digital technologies for decades, beginning with underwater robots in the 1970s. Today, it's developing – and applying – a variety of Industry 4.0 technologies across its global network including oil and gas exploration and production, refining, petrochemicals, lubricants, aviation and more.

## What Others are Saying



“What’s happening at Shell is pretty amazing. They have a very deliberate strategy of using AI, right across their operation...from the drilling operations to safety in... Shell Retail stations.”  
Satya Nadella, Chief Executive Officer, Microsoft, Ignite, 2018



“[Shell has] the largest AI deployment that we are aware of anywhere in the world. Everybody else is kind of looking at it. These guys are rolling it out.”  
Tom Siebel, Chief Executive Officer, C3IoT, Financial Times, 2018

## Sensing

Sensing is crucial to keeping industrial operations running smoothly. The ability to track information such as temperature, pressure, and vibration in real time helps operators balance throughput and yield, maintain plant safety, and optimize commercial performance. Shell is using embedded sensing systems at its facilities to make data available to decision makers and ensure that operations conform to environmental standards.

**Proof point:** Shell is working with industry partners, equipment vendors and research teams in the academic sector to develop sensors that can address the challenges of oil and gas operations.

## Virtual Reality

Shell is deploying virtual reality and augmented reality-based training programs. These enable realistic training environments to be created, so staff can become familiar with the functions of a plant and the emergency responses.

**Proof point:** While its new PE plant is under construction, Shell Polymers has used VR to build a virtual plant model that’s facilitating construction and training its operators. Similarly, Shell Aviation has developed a virtual reality-based simulation that offers advanced training in the complex procedure of refueling a plane.

## Robotics

In the oil and gas industry, many of the routine inspection tasks in harsh or remote frontier areas that humans normally undertake are increasingly being conducted by robots. Robotic systems have the potential to deliver a range of safety and commercial benefits. Shell is working with industry partners, vendors and academic institutions to develop novel robotic systems for specific applications.

**Proof point:** Along with Carnegie Mellon University in the USA, Shell has developed Sensabot robots for inspecting equipment in remote, harsh environments, refineries and chemical plants.

## Blockchain

In 2017, Shell set up a blockchain department that is exploring and building blockchain applications globally throughout the company in areas including exploration and production, mobility and renewable energies.

**Proof point:** To prevent its customers from unwittingly buying counterfeit products, Shell Lubricants is exploring a blockchain platform that tracks lubricants from production to customer. As the products move between parties, each can confirm they are receiving genuine products, and Shell can track and monitor supplies worldwide more securely and easily.

## Advanced Analytics

Digital sensors installed in Shell assets operations around the world – from production fields to manufacturing complexes – produce a constant flow of data. Applying advanced analytics to these data sets can help to improve these processes and enable better business decisions.

**Proof point:** The Shell Smart Fields approach uses state-of-the-art sensor technology to monitor and optimize recovery from oil and gas fields. Smart Fields technology has been known to increase the total production from a field by up to 10% for oil and by up to 5% for natural gas, all while boosting the rate of production.

## Artificial Intelligence

Shell was an early adopter of artificial intelligence. From machine learning to computer vision, deep learning to virtual assistants and autonomous vehicles to robotics, Shell has focused on a range of technologies that have supported advances in artificial intelligence.

**Proof point:** Shell uses software from Arria NLG, a London, UK based group, to monitor its rigs and write safety reports automatically.

# HELPING CONVERTERS TO SEIZE THE UPSIDE OF INDUSTRY 4.0

Shell Polymers believes companies that wish to remain competitive in this new, changing landscape should stay informed about the changes on the horizon and be open to embracing new opportunities.

Industry 4.0 technologies could transform the landscape of the plastics processing industry, so converters need to be prepared to seize the opportunities that it presents.

**The progressive converters may likely see many opportunities.**

- *Could robotics, sensing and process control capabilities help to improve the efficiency of your production lines?*
- *Could artificial intelligence provide a competitive edge through improved forecasting and planning?*
- *Could virtual-reality-based training help to alleviate the skills gap that the sector is facing?*

**But they may also see challenges.**

- *What will it take to future-proof your investment?*
- *What impact will it have on plant reliability?*

As a pioneer in this space, Shell has developed key insights. It has conducted numerous research and development programs, and applied Industry 4.0 technologies in many of the industrial complexes that it operates.

So, what does all this mean to you? In essence, collaboration and sharing expertise will be key to unlocking progress. Shell has developed valuable, independent insights in this area and is eager to support converters as they embrace these exciting new technologies. The Shell survey highlighted the need for third-party specialist support and Shell is ready to work with converters and help them embrace new opportunities that are opening up.

## Key Takeaways

### 1.

Shell's global survey of manufacturers reveals that converters and other manufacturing companies are engaged and optimistic about Industry 4.0 technologies. However, it's also clear that major concerns about the pace of change, the costs, and the lack of expertise in the sector are hindering the widespread uptake of these technologies.

### 2.

Shell has been at the forefront of digital technologies for decades, and is developing – and applying – a variety of Industry 4.0 technologies across its global industrial network in sectors including oil and gas exploration and production, refining, petrochemicals, lubricants and aviation.

### 3.

Collaboration and sharing expertise will be key to unlocking progress. Shell has developed valuable, independent insights in this area, so it is keen to support converters as they embrace these exciting new technologies.



To learn more about how you can stay on the cutting-edge of manufacturing innovation, follow the latest news and updates on our LinkedIn page.

# ABOUT SHELL POLYMERS

Shell Polymers is building a polyethylene plant that will produce 3.3 billion pounds of PE a year. Its strategic location in Monaca, USA, puts it within 700 miles of the majority of the current North American polyethylene industry.

The site will also house a large application hall that will have commercial-sized units for multilayer linear, low-density polyethylene film, high-molecular-weight film, pipe and injection and blow molding. This will also be the home of 60 industry experts known as Shell's "Polymer Pioneers" and "Polymer Pros."

Using these state-of-the-art conversion machines and technical experts with proven track records in the industry, Shell Polymers will work with customers to troubleshoot issues, raise operational performance, or trial new product solutions.

For further information, please visit our website at [www.shell.com/polymers](http://www.shell.com/polymers)



## Sources

1. *Polyethylene Market*, December 2019 by Fortune Business Insights

This document is intended for information purposes only and sets out non-binding guidelines for the adoption of certain emerging technologies including: robotics, artificial intelligence, sensors, augmented and virtual reality, and other related digitalization and automation technologies into certain industrial applications and processes. The information and recommendations in this guide are not intended to be a comprehensive guide. Any data included herein is based upon analysis of representative samples and not the actual product shipped. Shell based the information on data believed to be reliable on the date compiled, and Shell undertakes no obligation to update it. Shell makes no representation or warranty, either expressed or implied, with regard to the completeness, accuracy, reliability or applicability of the information provided in these guidelines; that any product, technology, process, or material described shall be merchantable or fit for any purpose; reduce operating or manufacturing costs; or that the use of such information or product, process, technology, or material described will not infringe any patent. Each company should decide based upon their own decision-making process to apply the guidance contained in this document, in full, partly or to adopt other measures, and each company remains responsible for all determinations regarding any use of products, technologies, processes or materials described herein and for product and equipment in its possession and control. Specific procedures and requirements must adhere to applicable law and regulatory standards. Notwithstanding anything contained herein, nothing in these guidelines shall modify, amend, or override the terms and conditions set out in the contract agreed to among the parties, order acknowledgment and/or bill of lading. The expression 'Shell' or 'Shell Polymers' refers to the companies of the Shell Group that are engaged in chemical businesses. Each of the companies that make up the Shell Group of companies is an independent entity and has its own separate identity.